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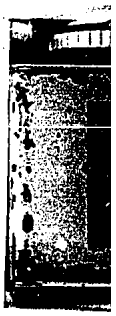

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PROPOSED REVISION OF USSR STATE STANDARDS

Because the editors of Vestnik Mashinostroyeniya ascribe great significance to the development of standardization, they ask their readers to discuss in the pages of this magazine the state of standardization in machine building, its shortcomings, its prospects, and the paths of future development. The reader is asked to express his opinion about:

1. The goals and tasks of state standardization in view of the rapid growth of machine building.

2. The system and methodology of work in the field of standardization, departmental and plant normalization, their mutual ties, and the organizational structure of central and local organs of standardization.

3. The expediency of working out in advance standards for machines that will be designed and put into production in the future.

4. The forms and prospects of development of interdepartmental (branch) normalization and a methodology for coordinating planned norms and standards.

5. The expediency of having recommended standards and the extent to which terminological standards are binding.

6. The methodology and expedient organizational forms for the control of the observance of standards and norms.

7. The organization of scientific research work on standardization in machine building and the teaching of the basic principles of standardization in machine-building institutes and tekhnikums.

8. All shortcomings and defects in individual standards and in the organization of standardization.

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The editors of Vestnik Mashinostroyeniya are opening the discussion of these questions with the following two articles in this issue of the magazine.

I

The GOSTs (State All-Union Standards) define the quality of raw materials, semifabricated articles, and articles and individual parts that are widely used.

State standardization encompasses only a part of the process of actual standardization going on in industry today. Enterprises and planning-designing organizations are standardizing elements, parts, and units of machines on a considerable scale on the basis of their own experience and by exchanging information on technical achievements with other analogous organizations. However, at this stage of development of the national economy, the results attained in standardization, although considerable, are still insufficient. Measures being carried out at present are also unsatisfactory, both in the scope and depth of the work and in the underlying principles guiding them, especially in the organization and leadership in this field of technology.

Let us review briefly the content and quality of several existing GOSTs in machine building. These standards (so-called terminological standards) provide a terminology and conventional designations for several branches of production, drafting of blueprints, systems of fits, tolerances, threads, metalware, tools, common units, and individual parts of machines.

In addition, the standards establish types, parameters, basic dimensions, and other specifications of machines used in a number of branches of the national economy.

The standards for types and basic dimensions of the most important machines are in the worst condition. It is sufficient to note that there are no GOSTs for types and parameters of machines for the mining, petroleum-extracting and refining, gas, metallurgical, and metal-processing industries, or for types and parameters of transport machines, freighters and other ships, etc. The extent to which standards encompass transport and hoist, hydraulic, logging textile, and other machines, compressors, and instruments for general purposes does not exceed 15-20 percent. There are no GOSTs for rolling mills, steam and diesel locomotives, wide-gauge railroad cars, hydroturbines, looms, and many other machines.

For several years, a GOST project defining the basic characteristics of ring spinning frames was worked on and repeatedly examined at various levels, but it was never completed. GOST projects for a number of other products of machine building suffered the same fate. The 2- and even 3-year period consumed in working out a GOST project often makes the standard obsolete by the time it is put into effect.

The observance of the comparatively few GOSTs which have been put into effect is very poor. There is, for example, GOST 2834-45 on the basic parameters of horizontal-drive pistons and direct-action steam pumps, confirmed in 1945 to take effect on 1 January 1946. Up to now, this GOST has not been reflected in a single-piston pump put out by the industry. As a result, plants continue to produce a great number of piston pumps of various types, frequently of cumbrous and antiquated design. Along with this GOST, there are a number of analogous standards for piston pumps, including some put out between 1939 - 1941.

It is not surprising that the Ministry of Petroleum Industry, when it started the typification of equipment, and, as a consequence, established the parameters of piston pumps needed to re-equip the petroleum industry of the USSR, came to the conclusion that the use of existing standards would only disorganize pump building and worked out its own departmental standards for piston pumps for petroleum products. We should also note that, despite the existence of the above-mentioned standards, a GOST project is also being worked on for piston pumps for shipbuilding. It is possible that standards for similar pumps for the river and maritime fleets and for the fish, food, chemical, and other branches of industry will be needed. OST (All-Union Standard) 3481 for centrifugal sand-blast pumps of the People's Commissariat of Heavy Industry is still considered in force, even though GOST 3299-46, covering the same pumps, was put out in 1946.

In 1939 - 1941, ten GOSTs covering machines and apparatus for the chemical industry (vacuum filters, filter presses, centrifuges) were put into effect, but not a single machine has been built to these specifications up to now. Moreover, the Ministry of Machine and Instrument Building, ignoring these standards, has put out its own departmental norms and is producing nonstandard machines on the basis of these norms.

The situation is the same with the majority of standards for types and parameters of many other machines. It is hard to find a case where a product was put out in complete conformity with the standards establishing the working dimensions of parts, units, and the machines as a whole. If this does happen, then the design in question has not been improved for many years, as is the case with parts of textile machines.

At the same time, norms have been worked out for hydroturbines, and the output of truly standardized hydroturbines has been organized outside the framework of the GOSTs. Similarly, a unified series of induction electric motors of standard design was developed and put into production outside the GOSTs, greatly increasing output, reducing labor consumption, and saving hundreds of millions of rubles per year.

A contrasting situation exists in those industries which do not devote constant and systematic attention to standardization. In 1947, the Ministry of Machine and Instrument Building started creating a so-called single basic design for the construction of unified machines for all types of fibers to re-equip enterprises of the textile industry and introduce order into an enormous, extremely variegated park of equipment by replacing antiquated machines with improved, automatic, and highly productive machines. However, the organizations carrying out standardization neglected this project, and it virtually came to a standstill. Textile-machine-building plants continue to receive numerous orders for new-model textile machines, and these orders are filled by dozens of unrelated machine-building enterprises. As a result, production of the machines ordered by textile enterprises is held up, and these machines often become obsolete before their series production is organized.

The increased demands on the organizations directing standardization call for a re-evaluation of the problem of standardization, its role in the development of machine building, the reasons why it is lagging, and a means of eliminating shortcomings. On the one hand, improved and increasingly specialized machines and mechanisms are demanded by the varied and increasingly complex requirements of the national economy. On the other hand, the production cost of any item, especially complex machines, is correspondingly lower, the less the machine varies from other machines. Less variation in design makes production easier, reduces labor consumption, increases the volume of production, and improves the operating qualities of the machine.

Although individual enterprises in capitalist countries standardize their products to reduce their cost, the efficacy of standardization as a whole in the capitalist economy is sharply reduced because of competition, firm secrets, obstacles set up by patents, and the lack of planning.

In a socialist economy, owing to the planned, constantly expanding national economy, the possibilities of standardization are limitless.

Consecutive modifications of design and limitation of the diversity of parameters and types of machines, parts, and materials used in building them are the basic means of standardization and should, at the same time, facilitate improvement of machines and their elements, reflecting progressive trends and bringing lagging enterprises up to the level of the most advanced. The conflict between standardization and technical progress gives rise to the difficult task of finding in every instance the most advantageous limits from the viewpoint of the national economy, and at the same time, of providing sufficient leeway for the new, that is, of making the standards sufficiently flexible.

A substantial obstacle /preventing the accomplishment of the above/ is the lack of clarity in interpreting concepts and terms related to standardization and the lack of uniformity in these terms and concepts (normalization, unification, typification). This lack of definition is also present in the organizational forms of standardization and is particularly manifest in the lack of centralized leadership, planning, and control in particular fields of industrial standardization carried on outside the framework of the GOSTs. This lack of definition, moreover, often cuts off the GOSTs from plant practice and makes them academic.

How can we define the concept of standardization more correctly? Of all existing and possible definitions, we should give preference to the one that best contributed to the successful attainment of the goals outlined by standardization. In machine building, a positive result of standardization would be a maximum of uniformity in machines, and also of their component units and parts, based on the most perfect and most sturdy models. Under these conditions, the time spent on planning and putting a machine into production is considerably shortened, and precedents are created for the effective application of advanced technology. The organization of mass and large-series production is, in general, impracticable without systematic standardization.

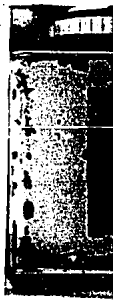
Thus, by standardization in the realm of machine building, we understand the whole complex of organizational and technical measures promoting standard designs and working dimensions of machines, their units, and parts. These measures should stand on an advanced technical level of machine building and satisfy the demands of the most advanced technological processes which these machines are intended to carry out.

Such a definition of standardization embraces work in unification (making uniform), normalization (adapting to established designs), and typification (adapting to defined types) organizes these concepts into a meaningful pattern, and makes it possible to analyze the nature of work in standardization in greater detail.

Let us review the content of various fields of work in standardization being carried on in machine building.

Primarily, this consists in working out GOSTs already mentioned above.

The next field of work in standardization is the development of departmental technical documentation, the so-called norms and specifications (departmental and plant), covering the same items as the GOSTs, but in greater detail,



and coming closer to the specific particularities of the given field of industry or of the given enterprise. To this category belong the blueprints of the most technically advanced enterprises, which find wide application in machine building because of the technical authority of these enterprises (for example, the blueprints of the Krasnyy Proletariy Plant, the Moscow Automobile Plant imeni Stalin, and others), even though there are no corresponding GOST or departmental norms.

Thirdly, the most important, largest in volume and significance, is the standardization carried on daily in planning, designing, and technological work. Without this standardization, which is not formulated in special documents, contemporary machine building could not progress, for all other types of work in standardization are based on it. However, only in comparatively rare cases do planning organizations and individual designers consciously bear in mind the principles of standardization in their work, as did the designers of the VIGM (All-Union Scientific Research Institute of Hydraulic Machine Building) in developing norms for hydroturbines. The designer who is not bound by compulsory standards and norms usually creates original designs. Borrowing the norms and blueprints of other organizations is not usually motivated by a striving toward standardization as such, but by a desire to speed up work and make it easier by using ready-made designs that have already proved themselves in practice.

Finally, control service which assures the adoption and observance of various types of standards (GOSTs, departmental norms, etc.) is a function which occupies a special place in standardization.

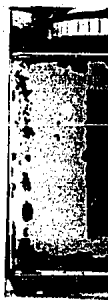
The four fields of standardization mentioned above are, in practice, its indispensable parts. Therefore, omission of even one of them would decisively reduce the effectiveness of standardization.

What is the present situation in the organization and the direction of work in these separate fields of standardization?

The planning of standardization, its methodical leadership and control, are the responsibility of a special all-Union organ, but in reality, this organ has for many years only concerned itself with reviewing and confirming GOSTs, that is, only a portion of the work in one field of standardization, since it does not even direct the development of GOST projects.

The second field of standardization consists of developing numerous departmental norms and specifications, and also plant norms. This primary, extremely vast, and important (from the practical viewpoint) fund of documentary standardization is left to develop by itself. At times, necessity compels many enterprises and departments to develop and apply an excessive number of such departmental norms, without taking their similarity into account. This work usually proceeds chaotically, unregulated by any principles, and it is sometimes entrusted to incompetent workers.

It is obvious that the time is ripe for creating in the national economy a strong framework for the organization, planning, operational administration, and control of all types of standardization work in the field of machine building and of guiding all units of this framework by a single set of regulations and instructions. These units should operate under the direct leadership of an all-Union organ in charge of standardization. A broad exchange of experience and corresponding information on the best existing norms for the organizational use of all departments, enterprises, design bureaus, and technological organizations is needed.



The third and most important field of work, the daily standardization in the process of planning, design, and technological development, is also unsupported by any special organizational-methodological measures. At best, it takes the form of type blueprints for units, parts, and elements which have become traditional in the limited sphere of a given organization. At present, there are no means of generalizing this experience and making it available to a wider circle of interested organizations.

Practice has demonstrated that the fourth field of work, covering the function of control and the adoption of standards, does not assure effective adoption of standards without special organization. Gradual systematic control of the adoption and observance of standards should be applied at all levels of the national economy by the appropriate organizations on a branch or territorial basis.

It has already been pointed out that the situation is worst in the GOSTs for types and parameters of machines, which are intended to set reasonable limits to the number of type designations of machines of standard design.

The standards for types and parameters of machines should define, on the basis of long-range production plans, the basic technical description of those machines which are to be produced in the future. These standards should, moreover, define exactly which parameters should be made the basis of a whole series of machines of a given class, groups, or type required by the national economy, that is, they should fix only those parameters which link a number of branches of machine building and may be considered generally accepted. Such parameters are the pressure and temperature of steam, current voltage, specific norms, and limitations on sizes and loads. More specific standards establishing power, minimum productivity, lifting power, speed, etc., should cover only those groups of machines which have been firmly established by practice, which have gone through the filter of branch and plant norms, proved themselves by long operation, and for which the consumer is in a position to set fully defined requirements.

This should set the basic limits of the applicability of the GOSTs covering the types and parameters of machines.

With regard to units and parts of individual types of machines, the standardization of their design and working dimensions should be transferred to ministries, main administrations, scientific research institutes, design bureaus, technological organizations, and plants. GOSTs on these articles should be rare exceptions and should be preserved only for such parts as universal fasteners (nuts and bolts), ball bearings, elements for electrical fasteners, etc.

Examples of successful work in the indicated direction are the typification of mining equipment, parts of steam locomotives and railroad cars, food-processing machinery, hydraulic machines, etc. Thus, for example, the unification and typification of the most important kinds of mining equipment (electric mine cars, hoist and transport equipment, pick hammers, and jigs) facilitated the creation, in less than a year, of standardized designs of various types of equipment and basically improved the mechanization of work in the coal industry. This work also revealed the unsoundness of a number of GOSTs and made clear the necessity of reviewing them promptly and bringing them into conformity with the new demands of the coal industry.

Based on the practice of the most progressive plants, a new organizational form of carrying out standardization is already being realized: the issuance by main plants of a uniform system of plant blueprints and norms which are compulsory for all plants duplicating the products of the main plant.

Another form of standardization would be the concentration of the planning, development, and application of so-called branch (interdepartmental) norms for a more or less wide circle of related articles in single centers: NII (scientific research institutes) and TsKB (central design bureaus). The working blueprints of all objects being put into series production, regardless of the departmental subordination of the enterprises making them, should conform to the above-mentioned norms. Plant plans for standardization should be brought to conformity in these main coordinating centers.

These and other measures should assure broad development of standardization, brought into being in the process of planning, designing, and technological development.

When new forms of directing standardization and its local organizations are sufficiently consolidated, there will be no need for GOSTs on the great majority of common elements of machine building, which only strangle the improvement of machines, freezing their design. Then it will become possible to concentrate attention on the standardization of the most important parameters and norms of a general character and, as a result, limit the comparatively small number of highly authoritative GOSTs for machine building.

Practice points out the path by which the desired results may be attained in the near future. It is sufficient to refer to the development of a unified series of electric motors and the typification of low- and medium-power hydroturbines already mentioned above.

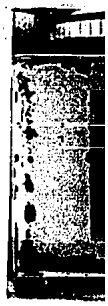
Machine builders of the ministries are faced with a problem of primary importance -- to review the type designations of machines and equipment they put out and to develop, with the aid of their consumers, a unified list of type designations of machines needed by all branches of the national economy in the near future.

The success achieved in the standardization, at the instigation of the state, of mining equipment and the basic elements of steam locomotives and railroad cars confirms the pressing need to carry out analogous work in other branches of machine building under the leadership and control of an all-Union organ for standardization. This method will throw light on the types of machines needed by the national economy and limit design variations of the latter to well-defined, expedient frame works, at the same time leaving enough freedom for painless and prompt corrections called for by daily practice.

The following measures must be kept in mind for the solution of the problems of standardization set forth in this article.

1. To reduce duplication of machines with respect to their parameters, design, and purpose, a model card form must be developed and a single all-Union card index should be organized in the Administration for Standardization, listing the basic technical features of all models and type sizes of machines, mechanisms, instruments, and apparatus accepted and used in production by the ministries. The ministries should supply all necessary data on new items to this machine-building card index as early as possible and also give notice of all fundamental changes such items have undergone in the process of being modernized. The card index should be available to all industrial, agricultural, construction, and transport enterprises and organizations.

2. Unified regulations and instructions for the planning, development, coordination, and control of the adoption of plant, branch, and state standards in machine building and for control of the observance of the requirements of standardization should be developed and confirmed. When doing this, GOSTs should be precisely delimited and should cover only the basic parameters of



the machine and the features which are important to the consumer. Plant and branch standards and organizational measures such as designating the main plants, the NII and KB, establishing the blueprint of the main plant, planning the development and adoption of standards, etc., must satisfy the need for mass design standardization.

3. All GOSTs on types of machines and their parts should be reviewed from this viewpoint, and GOSTs that are obsolete, not being observed in practice, or duplications should be eliminated. In the future, a gradual change should be made in a portion of the GOSTs, as corresponding changes are made in ministries and departments.

In conclusion, it must be noted that this brief analysis of the state of standardization points out the necessity of reviewing the scientific and technical bases of standardization and creating a socialist science of standardization which would take the place of the diverse viewpoints on this subject existing at present.

To this end, it would be useful to organize the preparation and publication of works on the methodology of standardization successfully applied in various branches of machine building (low- and medium-power hydroturbines, a unified series of electric motors and other electric machines, mining equipment, food-processing machinery, petroleum pumps, etc.) and also to arrange, in the near future, an all-Union production and technical conference on the standardization of machine building with respect to the needs of socialist industry and to the creation of a material base for Communist production.

There is no doubt that standardization will be a secure foundation for a further powerful upsurge of machine building in our country if it is organized in accordance with the general problems involved in developing a socialist national economy. -- Engineer A. A. Bunatyan

II

At present, there are more than 8,500 GOSTs in force in the USSR, and standardization embraces all branches of the national economy to a greater or lesser extent.

In a number of the most important branches of the national economy (metallurgy, petroleum industry, etc.), there are GOSTs for 80-90 percent of the products put out.

In the first half of 1951 alone, the Administration for Standardization under the Council of Ministers USSR confirmed 236 GOSTs, 67 of them covering products of the machine-building industry. The scope of some of these GOSTs is described below.

The GOST (to replace GOST 533-41) on two-pole steam-turbine electric generators (turbogenerators) provides for raising the efficiency factor of air-cooled turbogenerators by 0.21-0.53 percent, depending on the power of the generator. New types of turbogenerators with hydrogen cooling and having a higher efficiency factor than the air-cooled turbogenerators are introduced in this GOST. The efficiency factor of a 100,000-kilowatt turbogenerator is 97.8 percent with air cooling and 98.7 percent with hydrogen cooling. Moreover, the new GOST established a guarantee period of service for turbogenerators for the first time.

The GOST for lead automobile and bus storage batteries, confirmed to replace GOST 959-41, provides for batteries assembled in monoblocks made of ebonite or pitch-asphalt plastic with acid-resistant inserts, and also the use of mipor, miplast /microporous rubber and microporous plastic/, and other types of separation, along with wooden separation. The GOST increases the battery's capacity, measured by discharge when starting, by 10 percent. The guaranteed period of service of the battery exceeds the previously established term by 30-60 percent. Output of storage batteries with the indexes indicated by the new GOST will save a considerable amount of lead for the national economy.

The GOST for cardboard machines establishes nine type sizes of machines for the processing of all required types of cardboard, but at the same time, there are only two machine widths, 4,200 and 2,100 millimeters, which makes possible extensive unification of the units of cardboard-making equipment. The GOST establishes progressive operating speeds of the machines up to 450 meters per minute, facilitating their high productivity.

The GOST for wood-jointing machines establishes four type sizes of machines with tables from 220 to 820 millimeters wide, increases the number of revolutions per minute of the blade shaft by 15 percent, and sets up accuracy norms for the machine for the first time.

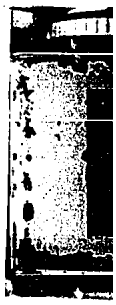
The GOST for windlasses with electric drives for ships reduces the number of type sizes from 50 to nine. A higher efficiency factor is established, and a saving of 14-80 kilograms of tin bronze per windlass is provided for.

New GOSTs for norms of accuracy for horizontal milling machines, increasing the accuracy requirements of these machines, have been confirmed. Also confirmed were new GOSTs for tractor cultivators for continuous tilling of soil, complex grain-cleaning machines, broad-gauge dump cars, machines for oxygen /oxyacetylene/ cutting, tools tipped with superhard alloys, ship fittings, etc.

On 1 January 1951, 3,101 standards were in force in the field of machine building, including: 1,828 standards in Section G, Machines, Equipment, and Tools; 369 standards in Section E, Power and Electrical Equipment; 652 standards in Section D, Means of Transport, Classes D1-7; and 272 standards in Section P, Control and Measuring Instruments and Apparatus.

Machine-tool building and electrical-machine building have the greatest proportion of output covered by standards, while the lowest proportion of output covered by standards is found in transport-machine building, heavy-machine building, and instrument building. However, we must note that absolute figures for the existence of standards and the extent to which they cover the type designations put out do not sufficiently characterize the state of standardization in a given field of machine building.

Let us review, for example, machine-tool building as the field of machine building best covered by standards. There are a total of 113 standards in effect in this section, 25 on basic sizes, 46 on norms of accuracy, and 42 on various units and parts (chucks, faceplates, sizes of spindle noses, table grooves, and turret and dividing heads). Standards on basic dimensions cover about 70 percent of the metal-cutting machine tools produced, which seemingly testifies to a high level of standardization. However, the standards for basic dimensions are unevenly distributed among groups of machine tools. Only lathes, turret lathes, trimming machines, slotting machines, and broaching machines are fully covered by these standards; while milling machines, drill presses, and planers are covered only from 70 to 96 percent. The extent to which these standards cover other machines is even lower. For tool-grinding machines, it



is 25 percent; for grinding machines, 32.3 percent; and for vertical lathes, 18.1 percent. There are no standards at all for dimensions of automatic and semiautomatic machine tools and gear processing machines. The development of standards for boring and coordinate grinding machines was begun in 1951.

There are standards for norms of accuracy for a considerable group of machine tools (about 77 percent). Lathes, turret lathes, trimming machines, slotting machines, and broaching machines are fully covered by these standards. Other groups of machine tools are covered by these standards 17 percent or more.

Standards for metal-cutting machine tools establish parameters for a very limited sphere of indexes, mainly for the maximum size of the article being machined, but omit indexes that are important to the consumer, such as the speed and power of the machine tools, their productivity, weight, and other indexes which characterize the modernity of the equipment.

Technical standards for the construction of machine tools, and also for a method of testing their operating qualities and reliability are completely lacking.

Of the 113 standards on machine tools and their parts, one was confirmed in 1929, four were confirmed in 1935 - 1937, 54 were confirmed in 1940 - 1941, 31 were confirmed in 1942 - 1945, 23 were confirmed in 1945 - 1950, and one was confirmed in 1951 (total amounts to 114). Thus, 59 standards, or 51.3 percent of the total, are from 10 to 22 years old, hence, completely out of touch with current practice. For example, OST of the People's Commissariat of Heavy Industry 8885/2347: "Gear Milling Machines (with the milling carriage on a table) Operating on the Generating Principle. Norms of Accuracy and Testing Methods" is considered in force, even though machine tools of this design are no longer produced. GOST 659-41: "Vertical Gear Milling Machines (with the milling carriage on a pedestal base) Operating on the Generating Principle. Norms of Accuracy" limits these machine tools to sizes making gears up to 750 millimeters in diameter, while USSR plants are making machine tools that will machine gears with diameters of 1,000, 1,500, 3,000 and 5,000 millimeters. The norms of accuracy established by this GOST are lower than those observed in industry.

In a number of other fields of machine building (for example, geological prospecting, mining, and concentration equipment), work in the field of standardization is completely unsatisfactory, despite the fact that there are very efficient institutes and design bureaus in these fields.

On 1 January 1951, there were 84 standards in force in group G-41, "Geological Prospecting, Mining, and Concentration Equipment." Of these, 64 (75 percent) were established 10 years ago or earlier, and 37 (about 45 percent) were recommended standards, that is, they were not compulsory. The majority (94 percent) of the standards established types and classifications of equipment, and only five standards (6 percent) set up specifications. Most of the standards of this group provide for obsolete types of concentrating equipment. There are no standards for coal-cutting machines, coal combines, loaders, rigs for geological prospecting, drilling, etc.

In group G-47, Machines and Equipment for the Chemical Industry; G-51, Machines and Equipment for Logging and Sawing; and G-71, G-72, G-73, and G-78, Machines and Equipment for the Food Industry and Trade, there are few standards in force, even though these branches of machine building have developed dozens of new machines and apparatus in the last few years.

STAT

Other examples of serious shortcomings in the field of standardization in machine building are as follows:

1. Extremely poor coverage by standards of the basic output of the machine-building industry.

2. The extremely small number of standards for specifications and testing methods.

3. The great percentage of standards established 10 years ago and earlier containing obsolete indexes.

4. The predominance of standards established on specific brands (marka) of machines or parts which have become obsolete.

In the past few years, the USSR machine-building industry has built and put into series production hundreds of new-type machines, mechanisms, and instruments which fully meet the requirements of modern technology. A number of fields of machine building have fully renovated the line of machines being produced by them in the postwar years.

It may be said with assurance that USSR machine builders are in a position to build and organize the production of any machine quickly, no matter how complex it is.

If standardization is to achieve its goal, complete group standards, including types and basic parameters, specifications, rules of acceptance, and testing methods, must be worked out.

Among the parameters that should be fixed by the standards are productivity, high-speed features, power, dimensions of basic working parts needed to turn out standard products, specific consumption of fuel or power, efficiency factor, and design elements defining the parameters and weight indexes of the machine.

Standards for specifications should define the basic requirements for a machine, insuring the necessary quality of manufacture. Among the indexes to be considered are consumers' performance requirements for the equipment, which define its accuracy (metalworking machine tool), comfortableness (automobile or bus), grade of cleaning (grain-cleaning machine), etc.; demands for reliability (guaranteed life of the product); requirements for materials of which the basic parts are made; requirements for sturdiness, anticorrosion coatings, and finish of the machine; and requirements for individual aggregates of the machine. Moreover, special specifications for the operation of the machines under specific conditions and surroundings (temperature, corrosives, etc.) should be provided.

Standards for testing methods and for rules for acceptance should define methods of controlling the quality of machines. Every requirement of the specifications should be reflected in the testing methods and rules of acceptance. The length of the tests and the number of samples tested should be defined, depending on the character of testing and the scale of production of the article.

Standardization of individual brands of machines and their parts (with the exception of parts such as bearings, which are widely used) leads to a standard which rapidly grows obsolete. At best, it becomes a document useful only to the historian; at worst, it strangles the development of new technology.

Standardization of individual machines and their parts should become the function of departmental and interdepartmental normalization. Departmental norms are more flexible and are more often changed by documents. Departmental normalization should be a continuation of standardization.

The following measures should be taken to achieve the goals of standardization:

Specifications for the manufacture and acceptance of metal-cutting machine tools should be developed, establishing stricter requirements for the quality of manufacture, operating reliability, and life of the machine tool, and also for supplying the machine tool with spare parts, necessary items, and fittings.

The development of standards for types and basic parameters for all general-purpose metal-cutting machine tools should be completed. Gear-cutting machines should be standardized, and a full range of type sizes based on parameters should be established to satisfy the needs of all branches of machine building, from watch and instrument building to heavy machine-tool building. Jig boring machines, horizontal boring machines (including heavy ones with spindle diameters up to 300 millimeters), multispindle bar automatics, and horizontal and vertical multispindle semiautomatic lathes should be standardized. The standards for vertical lathes should be reviewed, and a rational basis for the number of type sizes in the interval between one and 20 meters should be established to meet the needs of shipbuilding, transport-machine building, heavy-machine building, and other fields of industry.

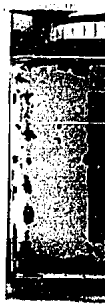
Along with the establishment of the /dimensional/ parameters and accuracy norms of the machine tools, the standards should also establish the basic parameters which characterize the modernity of the design of the machine tools (speed, power, etc.).

In the field of press and forging equipment, the standardization of equipment that is used throughout the industry, including horizontal forging machines, crank presses for forging and forming, and cold upsetting single-stroke and double-stroke automatic presses, should be completed.

Special attention must be given to the standardization of equipment for mechanizing heavy and labor-consuming tasks. The size of machines and mechanisms, their progressive productivity indexes, specific consumption of power, and metal consumption must be established. In the hoist and transport-equipment group, standards must be developed for cranes for the metallurgical industry, for fork lifts, and for tractor-mounted loaders.

In the field of machines for the coal and mining industries, coal combines, coal cutters, and coal and earth loaders must be standardized. Experience amassed from broad mechanization in the coal industry in recent years now makes it possible to establish the necessary parameters and requirements for this type of equipment.

Standards should be set up for hydroturbines, compressors, blowers, and various types of pumps. It is necessary to standardize these types of equipment because of the great number of enterprises, belonging to different departments, producing them. Standardization will considerably reduce the number of type sizes, leaving in production only those designs which have high operating indexes. Limiting the number of sizes will make it possible to unify the designs of elements of machines (wheels, pistons, shafts, etc.), thus increasing the mass nature of production and reducing the cost of products.



Standardization of equipment for light industry should first be extended to cover textile machines in large-series production.

The backwardness in standardization now existing in transport-machine building in the fields of rail, water, and automobile transport must be liquidated in the immediate future. The standards should establish types, specifications, and methods for testing the moving stock of rail and water transport, taking account of modern requirements for mechanizing loading and unloading.

Existing outdated GOSTs in the field of machine building should be reviewed in the next few years. Recommended standards should be turned into compulsory ones by making them more precise and supplementing them.

Reducing the weight of machines, and thus reducing the consumption of metal, has great practical significance in machine building. A broad range of types of machines and mechanisms, especially of the stationary type, are unnecessarily heavy because the safety factor and allowances in the casting of supports, bed frames, frames columns, etc., were increased in designing.

The new high-strength metals (modified and superhard iron and low-alloy steels), lightened welded design, and hollow instead of solid parts are not sufficiently applied in designing machines. Various modern methods of surface-hardening parts are not sufficiently employed. Standards should include progressive weight indexes based on the study of the most advanced designs, which will compel the designer to reduce the weight of machines to a minimum by allowing well-founded safety factors in parts, giving parts more rational forms, and using the other progressive techniques mentioned above. Above all, weight-limiting indexes should be applied to heavy equipment that is mass or series produced.

The machine-building ministries should put their best talents on the job of standardization so that the new indexes, established in standards, will reflect the present-day level of technology and guide technical policy in every field of machine building. -- V. V. Tkachenko, Candidate of Technical Sciences

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